

## CLAIMS

1. A tunable edge-emitting semiconductor laser (10) including a resonant cavity delimited by two reflectors (15, 20), one of which is a fixed reflector (15) and the other of which is a mobile reflector (20), and including an active section (1) with gain of length  $L_1$  and a tunable section (2) of length  $L_2$ , characterized in that the total length of the cavity  $L = L_1 + L_2$  is less than or equal to 20  $\mu\text{m}$ .
2. A tunable laser according to claim 1, characterized in that the length  $L_1$  of the active section (1) is from 5  $\mu\text{m}$  to 12  $\mu\text{m}$ .
3. A tunable laser according to either claim 1 or claim 2, characterized in that the length  $L_2$  of the tunable section (2) depends on the tuning range of the laser in accordance with the following equation:
 
$$\Delta\lambda = \lambda^2/2(n_1L_1+n_2L_2)$$
 where  $\Delta\lambda$  is the tuning range of the laser,  $\lambda$  is the emission wavelength of the laser, and  $n_1, n_2$  are the respective refractive indices of the first and second sections of the laser cavity.
4. A tunable laser according to claim 3, characterized in that it has a continuous tuning range  $\Delta\lambda$  greater than or equal to 30 nm.
5. A tunable laser according to any preceding claim, characterized in that the fixed reflector (15) and the mobile reflector (20) each have a reflectivity greater than or equal to 90%.
6. A tunable laser according to any preceding claim, characterized in that the fixed reflector (15) is an etched mirror.

7. A tunable laser according to claim 6, characterized in that the etched mirror of the fixed reflector (15) is an alternation of semiconductor and air.

5 8. A tunable laser according to claim 6, characterized in that the etched mirror of the fixed reflector (15) is an alternation of polymer and air.

10 9. A tunable laser according to claim 6, characterized in that the etched mirror of the fixed reflector (15) is an alternation of semiconductor and polymer.

15 10. A tunable laser according to any one of claims 6 to 9, characterized in that the fixed reflector (15) is on the front face of the active section (1).

20 11. A tunable laser according to any preceding claim, characterized in that the rear face of the active section (1) is antireflection treated.

12. A tunable laser according to any preceding claim, characterized in that the mobile reflector (20) is a mirror external to the laser cavity.

25 13. A tunable laser according to claim 12, characterized in that the mobile reflector (20) is of etched silicon.

14. A tunable laser according to claim 12, characterized in that the mobile reflector (20) is of nickel.

30 15. A tunable laser according to claim 12, characterized in that the mobile reflector (20) is of dielectric deposited on silicon.

35 16. A tunable laser according to any one of claims 12 to 15, characterized in that the mobile reflector (20) is controlled by a micro-electro-mechanical (MEM)

controller.

17. A tunable laser according to any one of claims 1 to  
16, characterized in that the tunable section (2) is an  
5 air area.

18. A tunable laser according to any one of claims 1 to  
16, characterized in that the tunable section (2) is a  
10 gas area.

19. A method of fabricating a tunable edge-emitting  
semiconductor laser according to claims 1 to 18,  
characterized in that it includes the following steps:

- 15 - producing a laser die (10) including a substrate  
(8) and an active layer (11) consisting of a gain  
medium, the length  $L_1$  of the gain medium being  
from 5  $\mu\text{m}$  to 12  $\mu\text{m}$ ,
- producing a fixed etched mirror (15) on the front  
face of the laser die (10),
- 20 - mounting the laser die (10) on a base (50), and
- producing a mobile reflector (20) on the base (50)  
to the rear of the laser die (10).

20. A method according to claim 19, characterized in that  
25 producing the etched mirror (15) includes the following  
steps:

- etching the active layer of the laser die,
- depositing a polymer in the etched area, and
- 30 - etching the polymer to constitute a mirror.

21. A method according to claim 19, characterized in that  
producing the etched mirror (15) includes the following  
steps:

- etching the active layer of the laser die,
- 35 - further epitaxial growth in the etched area of an  
undoped semiconductor transparent at the emission  
wavelength, and

- etching the transparent undoped semiconductor to constitute a mirror.

5 22. A method according to claim 21, characterized in that producing the etched mirror (15) further includes a step of depositing a polymer in the etched regions of the transparent undoped semiconductor.